

Zero Retries issue 0035 2022-03-04

Advanced Amateur Radio - Data Communications; Space; Microwave... the fun stuff! The Universal Purpose of Ham Radio is to have fun messing around with radios - Bob Witte K0NR. Ultimately, amateur radio must prove that it is useful for society - Dr. Karl Meinzer DJ4ZC. We are confronted by insurmountable opportunities! - Pogo. Nothing great has ever been accomplished without irrational exuberance - Tom Evslin. Irrational exuberance is pretty much the business model of Zero Retries Newsletter - Steve Stroh N8GNJ.

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor

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Request To Send

Countdown to [Hamvention](#) 2022 - May 20-22, in Xenia, Ohio - 11 weeks...

A quick note to the crowd I talked to this morning (Friday 2022-03-04) - Thanks very much for the kind words. Coming from you capable folks, it means a lot!

Sadly, the lead story of this issue of Zero Retries is yet again a Silent Keyboard. No, it's not particularly fun or uplifting (my usual experience in writing stories for Zero Retries) to write such stories, but I think it's important to do so because Amateur Radio needs to document such stories of Amateur Radio providing hands-on experience with radio technology and thus inspiring new technologies such as Ethernet that society now depends on and takes for granted.

Not to mention that it's sad that we typically only note, and write glowingly about such folks only after they've become Silent Keyboards. I've decided that's a shame and there should be recognition for such work, especially applied to Amateur Radio, and I've started with a slate of nominations that I submitted to the [2022 Hamvention Awards](#) which closed 2022-02-15. I'm also going to do so soon for the [2022 ARRL Technical Awards](#) which will close 2022-03-31.

I'm also considering creation of (after thinking about it a while) *to create* the **Zero Retries Awards for Technical Innovation in Amateur Radio**. More in a future issue.

As I put the finishing touches on this issue of Zero Retries, it has been two weeks since Russia began its war and invasion against Ukraine. I briefly considered writing about the use of radio communications by both sides from a technical perspective. I ultimately decided I can't write dispassionately about technology, in use, or speculative, while Ukrainians are dying in the onslaught in desperate defense of their country. [1](#) I just don't have it in me at the moment. I've parked the rough draft I wrote - perhaps later.

After I wrote about the idea of **US Amateur Radio Data Network (In the 2020s) - USARDN** in Zero Retries 0033, several people expressed confusion about how it could be implemented, especially my suggestion to use VARA FM (license fee and Windows required). Space didn't permit the inclusion of the additional detail contained in the article in this issue of Zero Retries - **A Radio for US Amateur Radio Data Network**, and **Special Temporary Authority (STA) and Part 5 Experimental Radio Service**. Substack doesn't (yet) make it (easy, supported) possible to email publish a subset / portion of a larger article published on Substack web pages. Substack is a great tool (you might not be reading Zero Retries if it didn't exist) and it's a long way from ideal, but it is making progress.

Life is *short* folks - get stuff *done*! I'm trying to live that mantra.

de Steve N8GNJ

David Boggs WA3DBJ - Silent Keyboard

A friend pointed out that the term "Silent Keyboard" is unique to Zero Retries, and thus some explanation is in order when I use that term. It's derived from the term "Silent Key" referring to Morse Code keys that now sit silent upon the death of their owner. My thought was that in this digital era, where many Amateur Radio Operators such as Zero Retries Readers, use computers as an integral part of Amateur Radio, the term "Silent Keyboard" is more appropriate.

After considerable web research I'm reasonably certain that associating callsign WA3DBJ with (this) David Boggs is correct. At least it's the only callsign for "David Boggs" that seems to match.

David Boggs was the co-creator, with Bob Metcalfe, of Ethernet. Per the New York Times article [David Boggs, Co-Inventor of Ethernet, Dies at 71](#):

After saving up for a radio operator's license, David began building ham radios, spending his nights chatting with other operators across the country. His brother remembered the two of them stringing antennas from a second-floor bedroom to the roof over the garage. "Back then, those wires seemed so long," said Walter Boggs, who still lives in the house. "Now it looks like a very short distance."

...

At PARC, as Mr. Metcalfe and Mr. Boggs pieced together a blueprint for Ethernet technology, borrowing ideas from a wireless network at the University of Hawaii called ALOHAnet. This work dovetailed with one of Mr. Boggs's oldest interests: radio.

A 2003 article in The Economist - [Out of the ether](#), mentions

Mr Boggs, also an accomplished radio engineer, remembers reading through Mr Metcalfe's dissertation and notebooks, and recognising parallels in broadcasting. Sending information by breaking it into "packets" of data and reassembling the packets was similar to Arpanet and AlohaNet.

WA3DBJ's [Wikipedia article](#) mentions:

Since Boggs had considerable experience as an amateur radio operator, he recognized similarities between Metcalfe's theories and radio broadcasting technologies and joined his project.

It would be stretch to say that without WA3DBJ's hands-on experience with Amateur Radio we wouldn't now have Ethernet (IEEE standard 802.3) and its radio counterpart Wi-Fi (IEEE standard 802.11). But I think it's indisputable that WA3DBJ's hands-on experience with Amateur Radio was fundamental to his approach to co-developing Ethernet.

During my working career, I lived through the evolution of Ethernet on its way to absolute ubiquity. The "LAN Wars" (Local Area Network) were so wild and woolly that [LAN Times](#), a dedicated magazine, was published for over a decade. I vividly remember the evolution of Ethernet from "Thicknet" to "Thinnet" to 10baseT and the competitive Local Area Networks such as [ARCnet](#) and especially [IBM Token Ring](#). In the end, Ethernet technology, from many vendors but fully interoperable, evolved faster, to *be* faster, better, easier, and cheaper. Once you could install LAN wiring with the same inexpensive tools as a telephone installer (side cutters, RJ-45 crimpers, punchdown tool), and do it for pennies instead of \$10s, [the "LAN Wars" were over](#).

WA3DBJ left behind no Internet presence that I can find. If anyone does know of any additional information about WA3DBJ's activities in Amateur Radio (post Ethernet), please let me know.

It's inspirational stories from modern technological life like WA3DBJ's where Amateur Radio was a foundational influence in creating modern technology that we as Amateur Radio need to highlight when the question rises frequently "So, what *is* Amateur Radio *actually* good for"? I shudder to suggest this... but perhaps we (someone? some organization?) should collect these stories on a website for easy reference for posterity?

APRS Foundation, Inc. Formed

[Jeff Hochberg W4JEW on the APRSSIG mailing list](#) 2022-03-02:

To our esteemed colleagues,
Thank you for your responses and kind words of encouragement in forging ahead with APRS.
I just wanted to take a moment to keep you in the loop.
As was discussed, we've begun the process of forming a non-profit corporation:
- Filed a Certificate of Incorporation of a Non-Stock Corporation with the State of Delaware
- Retained a Registered Agent for Delaware - Resident Agents, Inc. Dover, DE
Once we receive confirmation, we will move on to the next steps which include filing for an EIN and 501(c)3 status.
We will keep you posted on the overall status as things move along.
If you have any questions or comments, please let us know.
Thank you once again.
-JeffH
Jeff Hochberg
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Good news for the coordinated evolution of APRS!

A Radio for US Amateur Radio Data Network

This is a followup to my article [US Amateur Radio Data Network \(In the 2020s\) - USARDN in Zero Retries 0033](#).

One of the reasons I mentioned the Amateur Radio 50-54 MHz band for USARDN was a project that I mentioned in Zero Retries 0024 - **ÖVSV - New WRAN hardware - 7W 144/433 and 10W 52 MHz**. When I wrote that article in December, my impression was that this was a project in early development such as prototypes built and tested. In the three months since then, revisiting this new radio that included 50-54 MHz, I found more detail about this project. It's considerably more advanced than I understood in December, and is now called the [RPX-100](#).



Photo courtesy of Bernhard Isemann - <https://rpx-100.net>

Note that this is a project being developed in, and (at the moment, for) Europe, and the European VHF / UHF bands are different than US VHF / UHF bands.

The web page is a fascinating read. Here are some of the technical detail highlights:

- “50” MHz power is 15 watts
- “144” MHz, and “430” MHz power is 10 watts
- Management processor (optionally, assuming they become more available) is a [Raspberry Pi Compute Module 4](#). RPX-100 has developed a custom “carrier board” for the system to embed a Compute Module 4.
- The primary radio will be a [LimeSDR Mini](#). This radio supports a very wide range of software, including [GNU Radio](#).
- Display, buttons, microphone, etc. are all optional. *Finally* we’ll have a “just give me power, Ethernet, and antenna” radio designed for data.
- Power input will be 12 (actually 13.8) volts DC.
- Info made available for this project includes a [schematic](#) and a [bill of material](#).

A Wifi interface connects the RPX-100 with the LAN for remote operation, debugging and programming. The software is written C++ using liquid-dsp libraries. The [concept] of the WRAN software uses the IEEE 802.22 frame structure for prototyping to make use of super frames and preambles for cognitive channel management, which allows a dynamic resource allocation between base stations, but also between multiple users at one base station.

Orthogonal Frequency Division Multiple Access (OFDMA) is used in the upper layers, as Modulation techniques QPSK, 16-QAM and 64-QAM is supported.

The software will support a connection-oriented MAC layer with cognitive functionality for dynamic and adaptive scheduling and management of coexistence of base stations in the same time-frequency domain (superframes).

There is mention of a kit:

The kit includes the Radio Frontend manufactured with a form factor to fit as hat-board on the Compute Module 4.

... but no mention that kits are actually available for sale. There's also this linked page - [Getting started with a new RPX-100](#), thus they seem to be providing support for more than just prototype units. All in all, the RPX-100 page seems, to me, highly encouraging that this project has quietly progressed considerably beyond the prototype stage.

Looping back to **US Amateur Radio Data Network (In the 2020s) - USARDN**, imagine this radio as the basis of a USARDN "node" - flexibly switch between 52-54, 144-148, and 440-450 MHz bands. Plenty of signal processing power with the LimeSDR Mini to do advanced data modes... note the mention the advanced features that this system will have natively:

- ... super frames and preambles for cognitive channel management, which allows a dynamic resource allocation between base stations, but also between multiple users at one base station
- Orthogonal Frequency Division Multiple Access (OFDMA) is used in the upper layers, as Modulation techniques QPSK, 16-QAM and 64-QAM is supported.

This radio is so promising that I decided to beat the rush of supply chain issues and order a [Diamond V-2000A](#) omnidirectional vertical tri-band (52-54 / 144-148 / 440-450 MHz) antenna for experimentation with this radio. (Received in 2 days - gotta love the [Portland Ham Radio Outlet](#) and their two-day shipping to the US West Coast!) If it takes a while for the RPX-100 to appear, I have 50-54 MHz radios I can use to keep that set of elements warm on that new antenna.

Bottom line, I have high hopes for this project to become a reality, especially for sale outside Europe. Even if the creators choose not to create a kit and / or not market it outside Europe, it's open source so it's feasible that the design can be replicated in the US by, among others, [Crowd Supply](#) who by now has a great track record of making products related to radio technology and especially Amateur Radio, more widely available. One recent example is [LimeRFE](#) (LimeSDR Radio Front End) which adapts a LimeSDR software defined transceiver for Amateur Radio HF and VHF / UHF usage.

Thus... I'm hopeful for better **Amateur Radio DATA radios** such as the RPX-100 (and others in development) in the near future. I'll track developments on RPX-100 as closely as I can and I'll let you know about them here in Zero Retries.

Special Temporary Authority (STA) and Part 5 Experimental Radio Service

US Amateur Radio data communications on VHF / UHF bands are currently hamstrung with this inane (in the 2020s) [regulation](#):

50-54 and 144-148 MHz: (5) RTTY, data or multiplexed emission using a specified digital code listed in § 97.309(a) of this part may be transmitted. *The symbol rate must not exceed 19.6 kilobauds.* A RTTY, data or multiplexed emission using an unspecified digital code under the limitations listed in § 97.309(b) of this part also may be transmitted. *The authorized bandwidth is 20 kHz.*

222-225 and 420-450 MHz: (6) A RTTY, data or multiplexed emission using a specified digital code listed in [§ 97.309\(a\) of this part](#) may be transmitted. *The symbol rate must not exceed 56 kilobauds.* A RTTY, data or multiplexed emission using an unspecified digital code under the limitations listed in § 97.309(b) of this part also may be transmitted. *The authorized bandwidth is 100 kHz.*

I heard this statement made "a while ago"² that I think is highly relevant to the regulations cited above:

My feeling of how Part 97 should read is easy — "Here's your band limits. Have a nice day." I think we could fit the whole of Part 97 on this side of this three by five card in large type. So that even a bifocal guy like me could read it without glasses.

That "bifocal guy like me" statement was made by Lyle Johnson KK7P (then WA7GXD) in September 1996 at the ARRL and TAPR Digital Communications Conference in Seattle, Washington. Yup. **26 years ago**. Back then we were discussing spread spectrum.

My point here in quoting KK7P from 26 years ago is that waiting for the FCC Amateur Radio regulations to change is, at the moment, a near-hopeless exercise. (Why it's near-hopeless, at the moment, is a long discussion for a future issue of Zero Retries.)

So, let's imagine a bit of regulatory "kung-fu" in lieu of any "rationalization" of the FCC Amateur Radio regulations in the near term. The first such maneuver is [FCC Special Temporary Authority \(STA\)](#). That's what [TAPR](#) did back in 1996 with an STA to experiment with (then) modern forms of Spread Spectrum technology in Amateur Radio. I consider that STA successful because the Amateur Radio regulations were liberalized somewhat for allowing additional types of Spread Spectrum. (TAPR didn't achieve *all* of its goals for relaxing Spread Spectrum regulations in Amateur Radio, but that's another long discussion, potentially for a future issue of Zero Retries.)

At the time, TAPR had the advantage of a President (and Board) that embraced such advocacy, and more importantly was willing to finance such advocacy by hiring a respected Washington DC law firm that had deep experience with FCC matters to advocate on TAPR's (and the STA's) behalf.

My research into the potential to use an STA to experiment with modification of FCC Amateur Radio regulations is... laughingly preliminary. My sense is that the STA process doesn't (now) seem applicable to Amateur Radio experimentation. Perhaps it never was (from a cursory reading), and if so TAPR's law firm was able to explain and advocate despite those limitations.

There's another potential "kung-fu" in the FCC regulations and that is [Part 5 - Experimental Radio Service](#). Part 5 is the "Mad Science" provision of the FCC regulations - nearly "Anything Goes" as long as a [reasonable](#) case can be made for the experiment and no harmful interference is intended, anticipated, or caused. (If that happens, experiment ends - quickly.)

In a 2016 letter denying a Petition for Rulemaking from James Whedbee KA0MKT, the [FCC all but said that applying for a Part 5 license](#) is the preferred method for experimentation not explicitly permitted in current FCC regulations:

The Experimental Radio Service (ERS) rules contained in part 5 permit a broad range of experiments, including in the amateur service, and prescribe the manner in which the radio spectrum may be made available to experiment with new radio technologies, equipment designs, characteristics of radio wave propagation, or service concepts related to the use of the radio spectrum.

With either an STA, or a Part 5 license, the goal would be to prove, that staying within the stipulated maximum channel sizes...

Nothing bad happens when you are able to achieve data communications speeds in excess of "19.6 kilobauds" on 50-54 MHz or 144-148 MHz, or "56 kilobauds" on 220-222 MHz or 420-450 MHz.

A perfect example of the idiocy of these inane regulatory constraints is that 100 kHz channels are permissible on 222-225 MHz and 420-450 MHz. [New Packet Radio](#) was designed to use 100 kHz channels to achieve up to 500 kbps data rates. But in the US, solely because of the inane "56 kilobauds" limitation, NPR, using the same hardware, the same channel size, NPR operation "must" be *constrained*:

Note for USA: Due to CFR 47 Part 97 FCC regulations, for the 70cm amateur radio band (restriction to 100kHz and 56kBaud), only the setting "modulation 20" of NPR-70 seems to be legal in USA. Please always check your local amateur-radio regulation before buying and using NPR70.

Modulation 20: Symbol Rate 50kS/s, bandwidth 100kHz, raw datarate 100kb/s raw, usable datarate 65kb/s.

Apologies for hammering this point home, but *same hardware, same channel size*... by operating at the maximum 500 kbps that NPR is capable of, one is not "consuming more spectrum resources" by operating at that speed. In fact, it's the opposite - by operating at 500 kbps rather than 65 kbps, you use something like *85% less channel time*. I could go on, but you get the point.

In the 2020s, we ought to be working to change this inane regulatory constraint, or work around it, rather than consign ourselves, and constrain our systems, to live within it.

ZR > BEACON

- The [ICOM SHF Project – Super High Frequency Band Challenge](#) - "Newsletter" Volume 2 dated 2022-02-15 (PDF) is now available for download. Highlights:

The project team considered several ways to solve the cable loss issue. As a result, we decided to configure the RF module by directly placing it under the antenna and control it with a separate controller.

...

By adopting PoE technology, the connection can be made with a single cable, and the RF module can be installed more freely. Moreover, the PoE technology makes it possible to supply power with low power loss. Normally, if the power cable is extended to 20 meters, the voltage drop will be too large for a 10 watt transceiver, and it will not operate properly. With PoE technology, DC power loss can be reduced by raising the voltage and reducing the current, so it is possible to supply stable power, even if the cable is long.

I have a vague hope that Icom will be talking more about this project at Hamvention.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out

Join the Fun on Amateur Radio for some pointers.

Closing the Channel

- In its mission to grow Amateur Radio and make it more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex!
- My ongoing Thanks to Tina Stroh KD7WSF for, well, *everything* and Bill Vodall W7NWP as *Zero Retries Instigator in Chief*.

- My ongoing Thanks to pseudostaffers [Dan Romanchik KB6NU](#) and [Jeff Davis KE9V](#) for continuing to spot, and write about “Zero Retries Interesting” type items, on their respective blogs, from Amateur Radio and beyond, that I don’t spot on my own.
- [Southgate Amateur Radio News](#) consistently surfaces “Zero Retries Interesting” stories.
- The [Substack email publishing platform](#) makes Zero Retries possible. I recommend it for publishing newsletters.

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All previous issues of Zero Retries are available without restriction (no paywalls). For some background, Zero Retries 0000 was the **Introduction Issue**. Zero Retries 0026 and Zero Retries 0027 were a **2021 Year End Review** of Zero Retries.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ (He / Him)

These bits were handcrafted in beautiful Bellingham, Washington, USA

2022-03-04

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Blanket permission granted for TAPR to use any Steve Stroh content for the TAPR Packet Status Register (PSR) newsletter (I owe them from way back).

[1](#)

An exception will be a particularly inspiring story which I’ll send out via “Substack Threads”.

[2](#)

My thanks to Phil Karn KA9Q for a very good quality scan of the [TAPR Packet Status Register Fall 1996 Issue #64](#). The “official” scan of that issue on the TAPR website is (inexplicably) unreadable.

[3](#)

See [Experimental Radio News 3](#)